AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of the claims and all prior listings of the claims in the present application.

1. (currently amended) A method of reducing noise in a multiple carrier modulated (MCM) signal that has been equalized, the method comprising:

estimating impulse noise in the equalized signal; and

removing a portion of the noise from the equalized signal as a function of the estimated impulse noise;

wherein estimating the impulse noise comprises:

estimating total noise in the equalized signal; and

estimating the impulse noise based on the estimated total noise.

2. (previously presented) The method of claim 1, wherein the MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

3. (previously presented) The method of claim 1, wherein removing the portion of the noise also removes the portion of the noise from the equalized signal as a function of an estimated channel transfer function ($\hat{H}$).

4. (previously presented) The method of claim 1, wherein at least part of removing the portion of the noise takes place in a frequency domain.

5. (previously presented) The method of claim 3, wherein removing the portion of the noise comprises:

taking a matrix product of the estimated impulse noise and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$); and

subtracting the matrix product from the equalized signal.

6. (previously presented) The method of claim 1, wherein at least part of removing the portion of the noise takes place in a time domain.

7. (previously presented) The method of claim 3, wherein removing the portion of the noise comprises:

subtracting a time-domain estimated impulse noise from a received signal to form a time-domain compensated received signal.

8. (previously presented) The method of claim 7, wherein removing the portion of the noise further comprises:

taking a fast Fourier transform (FFT) of the time-domain compensated received signal to produce a frequency-domain version of the time-domain compensated received signal; and

taking a product of the frequency-domain version of the time-domain compensated received signal and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$).

9. (canceled)

10. (currently amended) The method of claim 1 [[9]], wherein at least part of estimating the impulse noise takes place in a time domain.

11. (currently amended) The method of claim 1 [[9]], wherein estimating the impulse noise further comprises:

using peak-detection to produce a time-domain version of the estimated impulse noise based on a time-domain version of the estimated total noise.

12. (currently amended) The method of claim 1 [[9]], wherein at least part of estimating the total noise takes place in a frequency domain.

13. (currently amended) The method of claim 1 [[9]], wherein estimating the total noise comprises:

estimating a baseband signal that includes a set of transmitted symbols;

subtracting the estimated baseband signal from the equalized signal to form a set of differences; and

multiplying the set of differences by an estimated channel transfer function ($\hat{H}$).

14. (currently amended) The method of claim 1 [[9]], wherein at least part of estimating the total noise takes place in a time domain.

15. (currently amended) The method of claim 1 [[9]], wherein estimating the total noise comprises:

estimating a baseband signal that includes a set of transmitted symbols;

taking a matrix product of the estimated baseband signal and an estimated channel transfer function ($\hat{H}$) to form a frequency-domain product;

taking an inverse fast Fourier transform (IFFT) of the frequency-domain product to form a time-domain version of the frequency-domain product; and

subtracting the time-domain version of the frequency-domain product from a received signal to form a time-domain version of the estimated total noise.

16. (previously presented) The method of claim 1, wherein estimating the impulse noise and removing the portion of the noise can be performed iteratively,

wherein a first iteration results in a first noise-reduced version of the equalized signal,

wherein the method further comprises making a second iteration of estimating the impulse noise and removing the portion of the noise in which estimating the impulse noise operates on the first noise-reduced version of the equalized signal, and

wherein the second iteration produces a second noise-reduced version of the equalized signal that has a lower noise content than the first noise-reduced version.

17. (previously presented) The method of claim 16, further comprising:

making a third iteration of estimating the impulse noise and removing the portion of the noise in which estimating the impulse noise operates on the second noise-reduced version of the equalized signal;

wherein the third iteration produces a third noise-reduced version of the equalized signal that has a lower noise content than the second noise-reduced version.

18. (previously presented) The method of claim 1, further comprising:

clipping, prior to equalizing the MCM signal, peaks of the MCM signal above a threshold;

wherein the equalized signal is an equalized version of the clipped MCM signal.

19. (previously presented) The method of claim 18, wherein clipping the peaks of the MCM signal above the threshold clips the MCM signal to either a threshold level or to zero.

20. (previously presented) An apparatus for reducing noise in a received multiple carrier modulated (MCM) signal, the apparatus comprising:

a Fourier transformer operable on the received MCM signal;

an equalizer operable to equalize a Fourier-transformed signal from the Fourier transformer;

a total-noise estimator operable to estimate total noise in the equalized signal from the equalizer;

an impulse-noise estimator operable to estimate impulse noise based on the estimated total noise; and

a noise compensator operable to remove a portion of impulse noise from the equalized signal as a function of the estimated impulse noise.

21. (original) The apparatus of claim 20, wherein the MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

22. (previously presented) The apparatus of claim 20, wherein the noise compensator also is operable to remove the portion of the impulse noise from

the equalized signal as a function of an estimated channel transfer function ($\hat{H}$).

23. (previously presented) The apparatus of claim 20, wherein at least part of the removal by the noise compensator takes place in a frequency domain.

24. (previously presented) The apparatus of claim 22, wherein the noise compensator further is operable to remove the portion of the impulse noise by:

taking a matrix product of the estimated impulse noise and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$); and

subtracting the matrix product from the equalized signal.

25. (previously presented) The apparatus of claim 20, wherein at least part of the removal by the noise compensator takes place in a time domain.

26. (previously presented) The apparatus of claim 22, wherein the noise compensator further is operable to remove the portion of the impulse noise by:

subtracting a time-domain estimated impulse noise from the received MCM signal to form a time-domain compensated signal.

27. (previously presented) The apparatus of claim 26, wherein the noise compensator further is operable to:

take a fast Fourier transform (FFT) of the time-domain compensated signal to produce a frequency-domain version of the time-domain compensated signal; and

take a product of the frequency-domain version of the time-domain compensated signal and an inverse ($\hat{H}^{-1}$) of the estimated channel transfer function ($\hat{H}$).

28. (previously presented) The apparatus of claim 20, wherein the impulse-noise estimator is operable to estimate the impulse noise in a time domain.

29. (previously presented) The apparatus of claim 28, wherein the impulse-noise estimator further is operable to estimate the impulse noise by:

using peak-detection to produce a time-domain version of the estimated impulse noise based on a time-domain version of the estimated total noise.

30. (previously presented) The apparatus of claim 20, wherein the total-noise estimator is operable to provide the estimated total noise in a frequency domain.

31. (previously presented) The apparatus of claim 30, wherein the total-noise estimator further is operable to estimate the total noise by:

estimating a baseband signal that includes a set of transmitted symbols;

subtracting the estimated baseband signal from the equalized signal to form a set of differences; and

multiplying the set of differences by an estimated channel transfer function ($\hat{H}$).

32. (previously presented) The apparatus of claim 20, wherein the total-noise estimator is operable to provide the estimated total noise in a time domain.

33. (previously presented) The apparatus of claim 32, wherein the total-noise estimator further is operable to estimate the total noise by:

estimating a baseband signal that includes a set of transmitted symbols;

taking a matrix product of the estimated baseband signal and an estimated channel transfer function ($\hat{H}$) to form a frequency-domain product;

taking an inverse fast Fourier transform (IFFT) of the frequency-domain product to form a time-domain version of the frequency-domain product; and

subtracting the time-domain version of the frequency-domain product from a received signal to form a time-domain version of the estimated total noise.

34. (previously presented) The apparatus of claim 20, wherein one of the following applies:

the equalizer is operable to determine an inverse ($\hat{H}^{-1}$) of an estimated channel transfer function ($\hat{H}$) and the noise compensator is operable to invert the inverse ($\hat{H}^{-1}$) to produce the estimated channel transfer function ($\hat{H}$);

the equalizer is operable to determine the estimated channel transfer function ($\hat{H}$) and the noise compensator is operable to produce the inverse ($\hat{H}^{-1}$); or

the equalizer is operable to produce both the inverse ($\hat{H}^{-1}$) and the estimated channel transfer function ($\hat{H}$).

35. (previously presented) The apparatus of claim 34, wherein the total-noise estimator, the impulse-noise estimator, and the noise compensator are arranged in a first stage,

wherein the first stage is operable to output a first noise-reduced version of the equalized signal, and

wherein the apparatus further comprises at least a second stage that includes:

a second total-noise estimator operable on the first noise-reduced version of the equalized signal fed back to the second total-noise estimator;

a second impulse-noise estimator; and

a second noise compensator operable to output a second noise-reduced version of the equalized signal that has a lower noise content than the first noise-reduced version of the equalized signal.

36. (previously presented) The apparatus of claim 35, wherein the second total-noise estimator also is operable on a received signal fed forward to the second total-noise estimator.

37. (previously presented) The apparatus of claim 35, wherein the apparatus further comprises at least a third stage that includes:

a third total-noise estimator operable on the second noise-reduced version of the equalized signal fed back to the third total-noise estimator;

a third impulse-noise estimator; and

a third noise compensator operable to output a third noise-reduced version of the equalized signal that has a lower noise content than the second noise-reduced version of the equalized signal.

38. (previously presented) The apparatus of claim 37, wherein the third total-noise estimator also is operable on a received signal fed forward to the third total-noise estimator.

39. (previously presented) The apparatus of claim 20, further comprising:

a first fast Fourier transformer (FFTR) configured to provide a frequency-domain version of a received signal to the equalizer;

wherein the impulse-noise estimator includes an inverse fast Fourier transformer (IFFTR) and a second FFTR,

wherein the IFFTR provides a time-domain version of the estimated total noise,

wherein the impulse-noise estimator is operable to provide a time-domain estimate of the impulse noise based on the time-domain version of the estimated total noise, and

wherein the second FFTR is operable to provide a frequency-domain version of the time-domain estimated impulse noise.

40. (previously presented) The apparatus of claim 20, wherein the impulse-noise estimator is operable, in part, to make an inverse fast Fourier transformation (IFFT),

wherein the noise compensator is operable, in part, to make a fast Fourier transformation (FFT),

wherein the apparatus further comprises a fast Fourier transformer (FFTR),

wherein the apparatus is configured to selectively connect the FFTR according to at least three layouts,

wherein a first layout has connections such that operation of the FFTR can provide a frequency-domain version of the received MCM signal to the equalizer,

wherein a second layout has connections such that operation of the FFTR can form a part of the IFFT, and

wherein a third layout has connections such that operation of the FFTR can form a part of the FFT.

41. (previously presented) The apparatus of claim 40, wherein the first, second, and third layouts are part of a first arrangement,

wherein the first arrangement is operable to output a first noise-reduced version of the equalized signal,

wherein the apparatus further is operable to selectively adopt at least a second arrangement in which the second layout operates on the first noise-reduced version of the equalized signal fed back to the second layout, and

wherein the noise compensator in the second arrangement is operable to output a second noise-reduced version of the equalized signal that has a lower noise content than the first noise-reduced version of the equalized signal.

42. (previously presented) The apparatus of claim 41, wherein the apparatus further is operable to selectively adopt at least a third arrangement in which the third layout operates on the second noise-reduced version of the equalized signal fed back to the third layout, and

wherein the noise compensator in the third arrangement is operable to output a third noise-reduced version of the equalized signal that has a lower noise content than the second noise-reduced version of the equalized signal.

43. (currently amended) An apparatus for reducing noise in a multiple carrier modulated (MCM) signal, the apparatus comprising:

a down-converter;

an analog-to-digital converter configured to digitize output of the down-converter;

a guard-interval removing unit operable on the digitized output of the down-converter; and

a combined fast Fourier transform (FFT), equalization, and impulse-noise-compensation unit operable to equalize a signal from the guard-interval removing unit, to estimate an impulse noise in the equalized signal, and to remove the estimated impulse noise from the equalized signal;

wherein the combined FFT, equalization, and impulse-noise-compensation unit comprises:

an equalizer operable on the signal from the guard-interval removing unit;

a total-noise estimator operable on a signal from the equalizer;

an impulse-noise estimator operable on a signal from the total-noise estimator; and

a noise compensator operable on the signal from the equalizer and the signal from the impulse-noise estimator.

44. (canceled)

45. (previously presented) The apparatus of claim 43, wherein the MCM signal is an orthogonal frequency-division multiplexing (OFDM) signal.

46. (currently amended) A method of reducing noise in a received multiple carrier modulated (MCM) signal that has been partially equalized, the method comprising:

estimating impulse noise based on the partially-equalized received MCM signal; and

removing a portion of the noise in the partially-equalized received MCM signal in a time domain as a function of the estimated impulse noise;

wherein estimating the impulse noise comprises:

estimating total noise in the partially-equalized received MCM signal; and

estimating the impulse noise based on the estimated total noise.

47. (previously presented) The method of claim 46, wherein removing the portion of the noise in the received partially-equalized MCM signal produces a time-domain compensated signal, and

wherein the method further comprises:

equalizing a frequency-domain version of the time-domain compensated signal.

48. (previously presented) The method of claim 47, wherein equalizing the frequency-domain version of the time-domain compensated signal equalizes as a function of an estimated channel transfer function ($\hat{H}$).